



## Translation and cross-cultural adaptation of the Pediatric Sleep Questionnaire into Portuguese language



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### ABSTRACT

**Objective:** The need for culturally appropriate and linguistically accessible instruments for assessing sleep quality among children has expanded. The Pediatric Sleep Questionnaire (PSQ) is a validated tool for sleep disordered breathing among children. Our aim was to cross-culturally translate and adapt the PSQ into Portuguese language for use in clinical and research settings.

**Methods:** The PSQ was translated into Portuguese language in accordance with the stages recommended by International Guidelines and reviewed by a panel of experts. The caregivers of 180 children (aged from 4 to 12 years) answered the Portuguese version of PSQ. The reliability of the translated questionnaire was measured by Cronbach  $\alpha$ , Pearson correlation and Kappa statistics.

**Results:** Reliability analysis yielded an overall Cronbach  $\alpha$  of 0.781, confirming the survey's consistency. The Cronbach  $\alpha$  of the Portuguese PSQ domains ranged between 0.61 and 0.7. Test–retest reliability for all items was robust with correctness of >90.0% in all items, and the Kappa statistic ranged between 0.5 and 0.8.

**Conclusion:** The Portuguese version of PSQ has sufficient reliability and validity to measure sleep disordered breathing outcomes, and showed to be linguistically accurate and acceptable for use by children in Portugal.

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### 1. Introduction

Sleep-disordered breathing (SDB), including obstructive sleep apnea (OSA) syndrome, is acknowledged to be a cause of morbidity in children. Clinical symptoms of OSA among children include snoring, nocturnal arousals, restlessness during sleep, enuresis, daytime sleepiness, and hyperactivity [1,2]. As a result of increasing international collaboration in sleep research, the need for culturally appropriate and linguistically accessible instruments for assessing sleep quality among children has expanded [3]. This is particularly true in Portugal, where there are very few of such instruments available. Having these validated tools is very important when evaluating specific sleep treatment outcomes across different countries. Specifically, both methods used by

patients and caregivers to describe sleep problems and the assessment of the effects of treatment must be comparable, irrespective of patients' language and cultural background. Recognizing these needs, the International Paediatric Sleep Education Task Force concluded that testing methodologies and culturally sensitive epidemiologic tools are key components of cross-cultural sleep research [4].

Despite a recent meta-analysis [5] suggesting that clinical evaluations have poor diagnostic accuracy, especially in regard to OSA, this does not mean that they should not be performed. As a result of a lack of paediatric sleep laboratories, sleep history is frequently the only instrument available to clinicians, especially in Portugal. Thus, sleep history should, and must, be part of routine health care visits as an initial screening tool for children at risk of OSA.

Based on this meta-analysis, the Sleep-Related Breathing Disorder scale within the Pediatric Sleep Questionnaire (PSQ) appears to be the only instrument validated by full overnight polysomnography (PSG) [6]. Furthermore, using the same gold

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standard, the PSQ was also tested by Spronson et al. [7] in the UK. Thus, it is the most reliable questionnaire for sleep apnea screening.

The purpose of the current study was to evaluate a translation of the PSQ in children in Portugal by checking the accuracy of the translation, assessing its content validity, and determining whether or not it could be clearly understood when piloted in a sample of children.

## 2. Materials and methods

### 2.1. The Paediatric Sleep Questionnaire

The validated PSQ has 22 items documenting the presence or absence of common symptoms such as snoring, observed apneas, breathing difficulty during sleep, daytime sleepiness, and inattentive or hyperactive behaviour. Positive responses are scored as 1 and negative responses as 0. Then, the overall score is divided by 22 to provide a final value. Compared with overnight PSG, the PSQ has been reported to have a sensitivity of between 0.81 and 0.85 and a specificity of 0.87 in detecting OSA. A cut-off value of eight positive responses is thought to be most effective in identifying OSA. Subscales within the PSQ include a seven-item sleepiness scale, a nine-item snoring scale, and a six-item behavioural scale.

### 2.2. Study design

After obtaining ethical approval from the Institutional Review Board and receiving copyright permission, an adaptation of the PSQ questionnaire was performed. A written informed consent was obtained from all parents. The adaptation process followed internationally recommended steps for translation [3], including back-translation, translation evaluation by a judging committee and pilot testing of the pre-final version. A schematic overview of the linguistic validation process is illustrated in Fig. 1.

Two translations of the questionnaires from the original language to the target language were conducted. Bilingual translators (VC and FFL) whose first language was the target language independently produced the two translations. Once the two translated versions were created, a consensus version was established by reconciling the differences between the two translated versions. This was achieved through a discussion between the translators and a recording observer. The goal was to enhance cultural sensitivity and appropriate wording of the instrument. The reconciled version was then independently back-translated into the original language by two naive translators whose first language was the source language (English). The primary objective was to ensure that the translated version reflected the same item content as the original. Subsequently, the back-translated versions were reviewed by the research team.

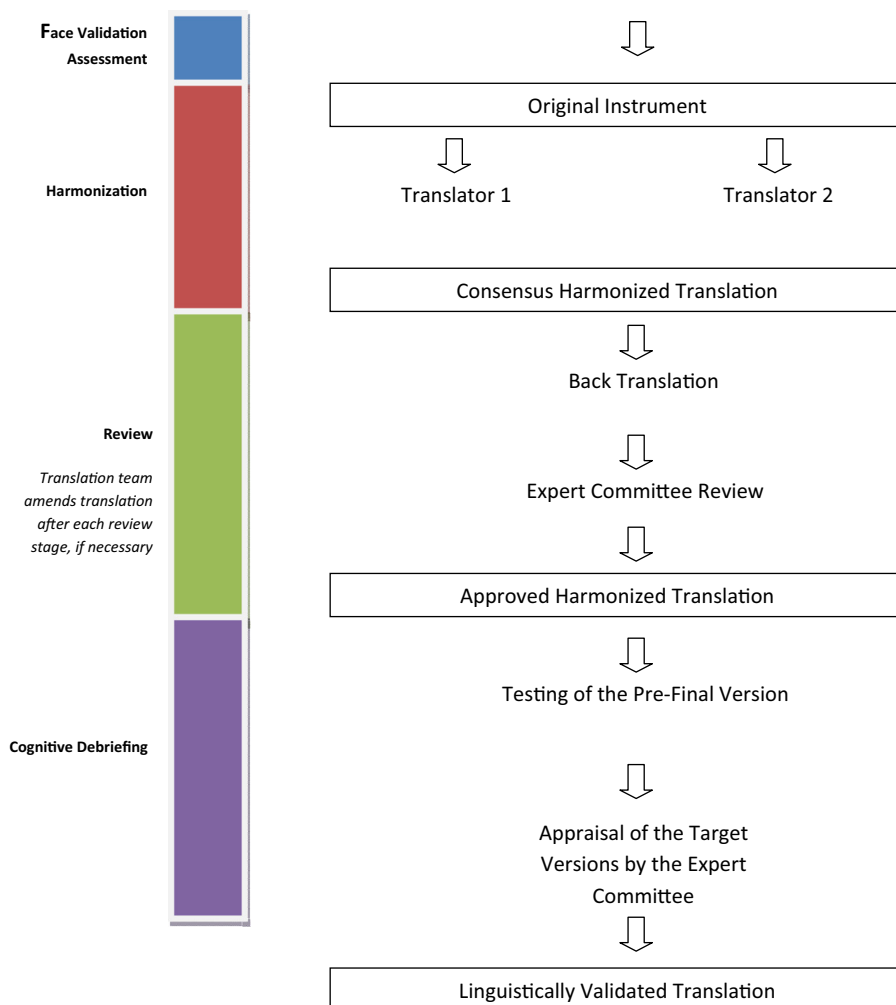


Fig. 1. Overview of the linguistic evaluation process.

An expert committee was created, and its role was to develop the pre-final version for field-testing. The goal was to achieve semantic, idiomatic, experiential, and conceptual equivalence, which ensured an accurate translation and an appropriate cultural adaptation. This committee comprised health professionals, language professionals, and all the involved translators. The committee reviewed all translations and reached consensus on any discrepancies.

The next step was to test the pre-final version by conducting a pilot study that aimed to assess the clarity, appropriateness, and cultural relevance (i.e. appropriate cultural adaptation) of the target language version. This cognitive debriefing exercise involved the completion of the instrument by a sample of 50 participants. Each subject completed the questionnaire and was subsequently interviewed about the meaning of each item. The responders answered the PSQ twice after at least an interval of 21 days.

Based on the findings of the pilot testing of the pre-final version, further modifications were made to the Portuguese PSQ. The final version of the Portuguese PSQ (Appendix) was applied between June and September 2014, and involved 180 parents of school children aged 4–12 years from a tertiary hospital in Northern Portugal.

### 2.3. Statistical analysis

The survey's degree of internal consistency (Cronbach's alpha) was validated based on the level of homogeneity between the different items of the questionnaire where a value of  $\geq 0.7$  indicated high reliability,  $0.5–0.7$  = moderate,  $0.2–0.4$  = fair and  $\leq 0.2$  = low reliability, respectively [8]. Content validity was analysed using Pearson correlations of each item with the total of the respective subscales and the total score ( $\rho$  more than 0.3 is considered moderate and anything 0.8 and above is strong). Long-term stability of the translated questionnaire was tested using Kappa test,  $\kappa$  (test-retest reliability). The magnitude of the  $\kappa$ -value was set according to Landis and Koch [9] as follows:  $\leq 0$  = poor,  $0.01–0.20$  = slight,  $0.21–0.40$  = fair,  $0.41–0.60$  = moderate,  $0.6–0.80$  = substantial and  $0.81–1$  = almost perfect agreement, respectively.

The data sets were analysed using SPSS (Statistical Package for Social Sciences) statistical analysis software SPSS (Statistical Package for the Social Sciences) Version 20 (SPSS, Inc., USA).

### 3. Results

The sample consisted of 180 Caucasian children, including 99 males (55%) and 81 females (45%), with a mean age of  $5.5 \pm 2.0$  years (4–12 years). Based on Graffar's socioeconomic classifications [10], 5 children belonged to Class I (3%), 9 to Class II (5%), 117 to Class III (65%), 45 to Class IV (25%) and 4 to Class V (2%). Eighteen caregivers (10%) graduated from university, 11 (6%) graduated from high school or two-year degree programmes, 45 (25%) did not complete high school or two-year degree programmes and 106 (59%) completed elementary school. The demographic data are shown in Table 1.

The results showed mouth breathing in among 2.9% of patients, loud snoring in 5.8%, and disturbed breathing during sleep in 2.5%, respectively. Sleepiness was reported among 15.3% of the patients, and behavioural problems were reported for 15.4%. There was a moderate correlation between loud snoring and sleepiness ( $\rho = 0.32$ ) and a weak correlation between loud snoring and behavioural domains ( $\rho = 0.21$ ). Thirty-one (17.0%) of the 180 participants revealed positive symptoms for SDB.

Reliability analysis was carried out using SPSS based on internal consistency, yielding a Cronbach's alpha of 0.781 of the total items in the study. In terms of the instrument subscales, the snoring domain was  $\alpha = 0.609$ , the sleepiness domain was  $\alpha = 0.612$  and the behavioural domain was  $\alpha = 0.701$  (Table 2). Percentages of

**Table 1**

Characteristics of the language validation studied sample.

Characteristics	
Sex, n (%)	
Male	99 (55)
Female	81 (45)
Age, years	
Mean $\pm$ SD	$5.5 \pm 2.0$
Range	4–12
Marital status of caregivers, n (%)	
Married/partnered	126 (70)
Single/divorced	54 (30)
Graffar classification, n (%)	
Class I	5 (3)
Class II	9 (5)
Class III	117 (65)
Class IV	45 (25)
Class V	4 (2)

**Table 2**

Internal consistency of the Portuguese PSQ.

Variables	Number of items	Cronbach $\alpha$
Snoring domain	9	0.609
Sleepiness domain	7	0.612
Behavioural domain	6	0.701
Total	22	0.781

correct answers to all items were  $>90.0\%$ . In addition, results revealed good test–retest reliability for all items (Table 3).

### 4. Discussion

With the increase in the number of international research projects, the need to adapt health status measures for use in languages other than the source language is of primary importance. The objective of this study was to translate the PSQ from English into Portuguese language by following the international translation guidelines.

**Table 3**

Test–retest reliability of the Portuguese PSQ.

Items	Kappa (SD)	P
A1	0.523 (0.165)	<0.001
A2	0.645 (0.103)	<0.001
A3	0.451 (0.165)	<0.001
A4	0.501 (0.201)	<0.001
A5	0.753 (0.251)	<0.001
A6	0.468 (0.101)	<0.001
A7	0.852 (0.095)	<0.001
A8	0.651 (0.084)	<0.001
A9	0.497 (0.099)	<0.001
B1	0.812 (0.111)	<0.001
B2	0.456 (0.093)	<0.001
B3	0.698 (0.201)	<0.001
B4	0.542 (0.165)	<0.001
B5	0.699 (0.302)	<0.001
B6	0.678 (0.165)	<0.001
B7	0.815 (0.198)	<0.001
C1	0.611 (0.165)	<0.001
C2	0.501 (0.143)	<0.001
C3	0.654 (0.164)	<0.001
C4	0.789 (0.213)	<0.001
C5	0.703 (0.197)	<0.001
C6	0.605 (0.163)	<0.001

SD = standard deviation.

Currently, PSG is widely considered to be the gold standard in diagnosing childhood SDB. However, PSG is very expensive, time consuming and not easy to carry out on children. As a result, such cases require simplified methods. In contrast, the PSQ is a quick, easy-to-use, highly reliable and consistent test used to evaluate the subjective aspects of sleep among children with OSA. As confirmed by the high reliability of the Cronbach's alpha (0.791) and significant consistency illustrated by the correlation between individual test items and total scores, this study showed that the Portuguese version of the PSG is an adequate translation and culturally appropriate adaptation.

Translation difficulties encountered as part of this study included the fact that some English words and sentences from the original PSQ were difficult to translate into Portuguese language (e.g. question C5 – 'Is your child restless or does he/she behave as if "his/her engine is always running"?'). However, an equivalent translation was identified, and all of the caregivers of children with OSA found the survey questions easy to understand; even those with medium-to-low income levels and low levels of education.

An important limitation that needs to be acknowledged is that our translated questionnaire was not tested in a population that over-sampled for OSA. In the original paper for the PSQ developed by Chervin et al., the ratio of the number of subjects tested for the questionnaire who had OSA to healthy controls was 1:2. In our sample, only approximately 10–11 children out of 180 children had snoring making the testing of these questions less reliable.

Also, although sleep history is an essential screening tool, care must be taken when used as a unique tool in this field. In fact, most screening tools rely on clinical evaluation, and in the specific case of paediatric sleep disorders, there are a number of reasons why sleep history can be misleading: the loudness of snoring does not necessarily correlate with the degree of obstructive apnea. Thus, children may have very noticeable snoring without apnea. Children with OSA experience obstruction primarily during rapid eye movement (REM) sleep, which occurs predominantly in the early morning hours when their parents are not observing them. Consequently, there is an underestimation of apnea. Moreover, some children have a pattern of persistent partial upper airway obstruction associated with gas exchange abnormalities, rather than discrete, cyclic apneas ('obstructive hypoventilation'). Since these children will not manifest pauses and gasps in their snoring, the condition may be misdiagnosed as primary snoring.

## 5. Conclusion

In conclusion, the translation of the PSQ was shown to be linguistically accurate and acceptable for use by children in Portugal. This Portuguese version of the PSQ is easy to understand, quickly completed, and will potentially be of interest to the Portuguese medical community.

## Conflict of interest

None.

## Funding

None.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.ijporl.2014.12.002>.

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